AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended): A method for producing an optical grating comprising:

designing an optical pattern;

inducing a ~~sufficient~~ predetermined number of positioning errors into the pattern to reduce the average of the errors to a predetermined number; and

recording the pattern with the ~~sufficient~~ predetermined number of errors into an optical element.

2. (Original): The method of claim 1 wherein the pattern comprises a plurality of segments, and the step of inducing errors comprises:

writing an additional number of segments than are required by a desired design.

3. (Original): The method of claim 1 wherein:

the predetermined number is about zero.

4. (Original): The method of claim 1 wherein:

the optical element is a mask, and the mask is used to form the grating.

5. (Original): The method of claim 4 wherein the step of recording comprises the step of:

exposing the mask with at least one beam.

6. (Original): The method of claim 4 wherein:

the errors are stitching errors; and

a group delay ripple error of the grating is decreased as the number of stitching errors is increased.

7. (Original): The method of claim 1 wherein:

the pattern includes information associated with one of a linear chirp and a non-linear chirp.

8. (Original): The method of claim 1 wherein the pattern comprises a plurality of segments, and the step of inducing comprises:

inducing a plurality of stitching errors into the pattern.

9. (Original): The method of claim 8 wherein the step of inducing the sufficient number of errors further comprises:

forming at least one segment to have a different period by adjusting a scaling factor of manufacturing equipment that is used in the step of recording.

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10. (Original): The method of claim 8 wherein:

each segment has an arbitrary period with respect to at least one of a previous segment and a subsequent segment in the pattern.

11. (Original): The method of claim 8 wherein the pattern comprises a plurality of bars and spaces, and the step of inducing the plurality of stitching errors comprises:

adjusting desired locations of edges of bars and spaces to pixel locations that are useable by manufacturing equipment used in the step of recording.

12. (Original): The method of claim 11 wherein:

the pixel locations coincide with a periodic grid.

13. (Original): The method of claim 12 wherein:

a size of the period of the grid is 25 nm or less.

14. (Original): The method of claim 12 wherein:

a size of the period of the grid is 10 nm or less.

15. (Original): The method of claim 11 wherein the step of adjusting comprises:

adjusting each of the desired locations to the nearest pixel location.

16. (Original): The method of claim 11 wherein:

the step of adjusting moves each desired location by up to one half of pixel spacing.

17. (Original): The method of claim 8 wherein the step of inducing a plurality of stitching errors comprises:

forming a plurality of sub-segments for each segment of the plurality of segments.

18. (Original): The method of claim 17 wherein:

at least one segment has a different period; and

each sub-segment has the same period as the segment from which it was formed.

19. (Original): The method of claim 17 wherein:

at least one segment has a different period; and

each sub-segment has a scaled period, such that sequential sub-segments from a particular segment have periods that range from a period that is greater than the period of a previous segment to a period that is less than the period of a subsequent segment.

20. (Original): The method of claim 17 wherein:

each sub-segment has an arbitrary period with respect to at least one of a previous sub-segment and a subsequent sub-segment.

21. (Original): The method of claim 1 wherein the pattern is continuously recorded into the optical element and comprises a plurality of bars and spaces, and the step of inducing comprises:

adjusting desired locations of edges of bars and spaces to pixel locations that are useable by manufacturing equipment used in the step of recording.

22. (Original): The method of claim 21 wherein:

the pixel locations coincide with a periodic grid.

23. (Original): The method of claim 22 wherein:

a size of the period of the grid is 25 nm or less.

24. (Original): The method of claim 22 wherein:

a size of the period of the grid is 10 nm or less.

25. (Original): The method of claim 21 wherein the step of adjusting comprises:

adjusting each of the desired locations to the nearest pixel location.

26. (Original): The method of claim 21 wherein:

the step of adjusting moves each desired location by up to one half of pixel spacing.

27. (Original): The method of claim 1 wherein the step of recording comprises the step of:

writing the pattern with at least one raster scanned e-beam.

28. (Original): The method of claim 1 wherein the step of recording comprises the step of:

writing the pattern with at least one raster scanned laser beam.

29. (Original): The method of claim 28 wherein:

the step of writing uses at least 24 beams.

30. (Original): The method of claim 28 wherein the step of writing uses a plurality of beams in parallel, and the method further comprises:

repeating the step of writing for multiple exposures and thereby reduce placement error.

31. (Original): The method of claim 1 wherein the step of recording comprises the step of:

writing the pattern with at least one shaped e-beam.

32. (Original): The method of claim 31 wherein the step of writing the pattern with at least one shaped e-beam comprises the step of:

writing a plurality of at least one type of geometrical shape.

33. (Original): The method of claim 32 wherein the step of writing the pattern further comprises the step of:

performing the step of writing the plurality of at least one type of geometrical shape for a sub-field of the optical element;

repositioning writing equipment after the step of performing for a subsequent sub-field.

34. (Original): The method of claim 1 wherein the step of recording operates with manufacturing equipment with a writing grid size of less than or equal to 10 nanometers.

35. (Original): The method of claim 1 wherein the step of recording operates with manufacturing equipment with a writing grid size of less than or equal to 25 nanometers.

36. (Original): The method of claim 1 wherein:

optical element is a fiber, and the step of recording forms the grating in the fiber.

37. (Original): The method of claim 36 wherein:

a group delay ripple error of the grating is decreased as the number of errors is increased.

38. (Original): The method of claim 1 further comprising:

including at least one phase shift in the pattern;

wherein the step of recording is operative to record the pattern with the at least one phase shift into the optical element.

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39. (Withdrawn): An optical mask that is useable to produce a grating comprising:

a pattern of bars and spaces, wherein the pattern includes a sufficient number of errors in the pattern to reduce the average of the errors to a predetermined number.

40. (Withdrawn): The mask of claim 39 wherein:

edges of the bars and spaces are locations coinciding with a periodic grid.

41. (Withdrawn): The mask of claim 40 wherein:

a size of the period of the grid is 25 nm or less.

42. (Withdrawn): The mask of claim 40 wherein:

a size of the period of the grid is 10 nm or less.

43. (Withdrawn): The mask of claim 39 wherein the pattern comprises a plurality of segments, and a number of the plurality of segments is greater than a number of segments required by a desired design.

44. (Withdrawn): The mask of claim 39 wherein:

the predetermined number is about zero.

45. (Withdrawn): The mask of claim 39 wherein:

the pattern includes information associated with one of a linear chirp and a non-linear chirp.

46. (Withdrawn): The mask of claim 39 wherein:

the errors are stitching errors; and

a group delay ripple error of the grating is decreased as the number of stitching errors is increased.

47. (Withdrawn): The mask of claim 39 wherein:

the pattern comprises a plurality of segments.

48. (Withdrawn): The mask of claim 47 wherein

at least one segment has a period that is different by a scaling factor.

49. (Withdrawn): The mask of claim 47 wherein:

each segment has an arbitrary period.

50. (Withdrawn): The mask of claim 47 wherein:

the errors are stitching errors induced by adjusting edges of the bars and spaces from desired locations of the edges of bars and spaces.

51. (Withdrawn): The mask of claim 50 wherein:

the edges of the bars and spaces are locations coinciding with a periodic grid.

52. (Withdrawn): The mask of claim 51 wherein:

a size of the period of the grid is 25 nm or less.

53. (Withdrawn): The mask of claim 51 wherein:

a size of the period of the grid is 10 nm or less.

54. (Withdrawn): The mask of claim 47 wherein:

each segment comprises a plurality of sub-segments.

55. (Withdrawn): The mask of claim 54 wherein:

at least one segment has a different period; and

each sub-segment has the same period as its associated segment.

56. (Withdrawn): The mask of claim 39 wherein:

the errors are induced by adjusting edges of the bars and spaces from desired locations of the edges of bars and spaces.

57. (Withdrawn): The mask of claim 39 wherein:

the pattern includes at least one phase shift.

58. (Currently Amended): A system that produces an optical grating, the system comprising:

means for designing an optical pattern;

means for inducing a ~~sufficient~~ predetermined number of positioning errors into the pattern to reduce the average of the errors to a predetermined number; and

means for recording the pattern with the ~~sufficient~~ predetermined number of errors into an optical element.

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59. (Original): The system of claim 58 wherein the pattern comprises a plurality of segments, and the means for inducing errors comprises:

means for writing additional segments than are required by a desired design.

60. (Original): The system of claim 58 wherein:

the predetermined number is about zero.

61. (Original): The system of claim 58 wherein:

the optical element is a mask, and the mask is used to form the grating.

62. (Original): The system of claim 61 wherein the means for recording comprises:

means for exposing the mask with at least one beam.

63. (Original): The system of claim 61 wherein:

the errors are stitching errors, and

a group delay ripple error of the grating is decreased as the number of stitching errors is increased.

64. (Original): The system of claim 58 wherein:

the pattern includes information associated with one of a linear chirp and a non-linear chirp.

65. (Original): The system of claim 58 wherein the pattern comprises a plurality of segments, and the means for inducing comprises:

means for inducing a plurality of stitching errors into the pattern.

66. (Currently Amended): The system of claim 65 wherein the means for inducing the sufficient number of errors further comprises:

means for forming at least one segment of the grating having a ~~to have~~ different ~~a~~ period from another segment of the grating by adjusting a scaling factor of the means for recording.

67. (Original): The system of claim 65 wherein:

each segment has an arbitrary period with respect to at least one of a previous segment and a subsequent segment in the pattern.

68. (Original): The system of claim 65 wherein the pattern comprises a plurality of bars and spaces, and the means for inducing the plurality of stitching errors comprises:

means for adjusting desired locations of edges of bars and a spaces to pixel locations that are useable by the means for recording.

69. (Original): The system of claim 68 wherein:

the pixel locations coincide with a periodic grid.

70. (Original): The system of claim 69 wherein:

a size of the period of the grid is 25 nm or less.

71. (Original): The system of claim 69 wherein:

a size of the period of the grid is 10 nm or less.

72. (Original): The system of claim 68 wherein the means for adjusting comprises:

means for adjusting each of the desired locations to the nearest pixel location.

73. (Original): The system of claim 68 wherein:

the means for adjusting moves each desired location by up to one half of pixel spacing.

74. (Original): The system of claim 65 wherein the means for inducing a plurality of stitching errors comprises:

means for forming a plurality of sub-segments for each segment of the plurality of segments.

75. (Currently Amended): The system of claim 74 wherein:

at least one segment of the grating has a different period from another segment of the grating; and

each sub-segment has the same period as the segment from which it was formed.

76. (Currently Amended): The system of claim 74 wherein:

at least one segment of the grating has a different period from another segment of the grating; and

each sub-segment has a scaled period, such that sequential sub-segments from a particular segment have periods that range from a period that is greater than the period of a previous segment to a period that is less than the period of a subsequent segment.

77. (Original): The system of claim 74 wherein:

each sub-segment has an arbitrary period with respect to at least one of a previous sub-segment and a subsequent sub-segment.

78. (Original): The system of claim 58 wherein the pattern is continuously recorded into the optical element and comprises a plurality of bars and spaces, and the means of inducing comprises:

means for adjusting desired locations of edges of bars and spaces to pixel locations that are useable by the means for recording.

79. (Original): The system of claim 78 wherein:

the pixel locations coincide with a periodic grid.

80. (Original): The system of claim 79 wherein:

a size of the period of the grid is 25 nm or less.

81. (Original): The system of claim 79 wherein:

a size of the period of the grid is 10 nm or less.

82. (Original): The system of claim 78 wherein the means for adjusting comprises:

means for adjusting each of the desired locations to the nearest pixel location.

83. (Original): The system of claim 78 wherein:

the means for adjusting moves each desired location by up to one half of pixel spacing.

84. (Original): The system of claim 58 wherein the means for recording comprises:

means for generating at least one raster scanned e-beam.

85. (Original): The system of claim 58 wherein the means for recording comprises:

means for generating at least one raster scanned laser beam.

86. (Original): The system of claim 85 wherein:

the means for generating at least one raster scanned laser beam generates at least 24 beams.

87. (Original): The system of claim 85 wherein:

the means for generating at least one raster scanned laser beam generates a plurality of beams in parallel and are used for multiple exposures and thereby reduce placement error.

88. (Original): The system of claim 58 wherein the means for recording comprises:

means for generating at least one shaped e-beam.

89. (Original): The system of claim 88 wherein the at least one shaped e-beam writes a plurality of at least one type of geometrical shape.

90. (Original): The system of claim 89 wherein the means for generating at least one shaped e-beam writes the plurality of at least one type of geometrical shape for a sub-field of the optical element, and repositions after writing for a subsequent sub-field.

91. (Original): The system of claim 58 wherein the means for recording has a writing grid size of less than or equal to 10 nanometers.

92. (Original): The system of claim 58 wherein the means for recording has a writing grid size of less than or equal to 25 nanometers.

93. (Original): The system of claim 58 wherein:

the optical element is a fiber, and means for recording forms the grating in the fiber.

94. (Original): The system of claim 93 wherein:

a group delay ripple error of the grating is decreased as the number of errors is increased.

95. (Original): The system of claim 58 wherein:

the pattern includes at least one phase shift; and

the means for recording is operative to record the pattern with the at least one phase shift into the optical element.